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Wakai et al.

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[54] **THIN FILM SEMICONDUCTOR DEVICE INCLUDING A DRIVER AND A MATRIX CIRCUIT**

5,529,630	6/1996	Imahashi et al.	437/174
5,529,951	6/1996	Noguchi et al.	437/174
5,561,081	10/1996	Takenouchi et al.	437/174

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FOREIGN PATENT DOCUMENTS

55-61069	5/1980	Japan	257/347
59-96761	6/1984	Japan	257/347
64-76715	3/1989	Japan .	
1-96961	4/1989	Japan	257/347
2-73623	3/1990	Japan .	
3-286518	12/1991	Japan .	

[73] Assignee: **Casio Computer Co., Ltd., Tokyo, Japan**

[21] Appl. No.: **441,395**

OTHER PUBLICATIONS

[22] Filed: **May 15, 1995**

Wagner et al., Formation of p-n Junctions and Silicides Using a High Performance Laser Beam Homogenization System, Applied Surface Science, vol. 43, 1989, pp. 260-263.

Related U.S. Application Data

Jhon et al., Crystallization of Amorphous Silicon by Excimer Laser Annealing With a Line Shape Beam Having a Gaussian Profile, Jpn. J. Appl. Phys., vol. 33, 1994, pp. L 1438-L 1441, Part 2, No. 10B, 15 Oct. 1994.

[62] Division of Ser. No. 287,849, Aug. 9, 1994, Pat. No. 5,477,073.

Foreign Application Priority Data

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Dec. 14, 1993	[JP]	Japan	5-342109
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[51] **Int. Cl.⁶** **H01L 21/336; H01L 21/84**

[52] **U.S. Cl.** **438/163; 438/166; 438/487**

[58] **Field of Search** 437/21, 40 TFI, 437/41 TFI, 101, 173, 174; 438/163, 166, 486, 487, 535, 308, 795

References Cited

[57] ABSTRACT

U.S. PATENT DOCUMENTS

A thin film transistor including a thin semiconductor film which has a central portion as a channel region, with the side portions of the semiconductor film except for the channel region being a source and a drain regions which includes n-type impurities such as phosphorus ions of high concentration (3×10^{15} atoms/cm²), and a low concentration region provided between the channel region and each of the source and drain regions including p-type impurities such as boron ions of a low concentration (1×10^{13} atoms/cm²) whereby the low concentration region serves to reduce the off current.

5,145,808	9/1992	Sameshima et al.	437/174
5,210,438	5/1993	Nakamura	257/536
5,248,623	9/1993	Muto et al.	437/21
5,397,718	3/1995	Furuta et al.	437/21
5,420,048	5/1995	Kondo	437/21
5,432,122	7/1995	Chae	437/174
5,496,768	3/1996	Kudo	437/174

14 Claims, 5 Drawing Sheets

